

# LOUISIANA PACIFIC

## Summary

Closed-Cycle Operation Cuts Cost \$700,000/year

Facing a lawsuit to clean up effluent flow to the ocean, Louisiana-Pacific's (L-P) 700 ton/day kraft pulp mill in Samoa, California, implemented a totally chlorine-free (TCF) bleaching process in the mid-1990s. In 2000, the mill completed a \$7.2 million closed-cycle TCF (CC-TCF) upgrade to increase plant output and cut costs even further.

Thus far, the CC-TCF process has cut annual operating costs \$700,000, while reducing mill water use as follows:

- Bleach plant effluent is down by 31%, to 9 m<sup>3</sup>/ADt\*, the lowest in North America,
- Mill process water use is down by 19%, to 42 m<sup>3</sup>/Adt.

Building on this success, L-P plans to implement an additional \$6 million CC-TCF upgrade that will enable the plant to produce pulp competitively with those using other bleaching processes. The upgrade will nearly eliminate bleach plant effluent, cutting it by 96%. Further, mill water use

should drop by 48%, while plant capacity is estimated to increase by 17%.

## Background

### TCF Bleaching Eliminates Dioxins

The pulp and paper industry is the fourth largest consumer of fossil fuels in the United States and the single largest consumer of process water. Pulp bleaching generates the most problematic wastewater, because the chlorine compounds used result in the discharge of pollutants such as chlorinated dioxins. In addition, the potential for recycling bleaching wastewater has been limited because of the corrosivity of the residual chlorine compounds.

Having exhausted many of the gains achievable through end-of-pipe pollution control, the pulp and paper industry is innovating process changes to improve wastewater quality. One approach uses no chlorine-containing compounds and is labeled totally chlorine-free (TCF) bleaching.

Recent advancements in alternative bleaching technologies have made recovery of thermal energy, process water, and bleaching chemicals a feasible approach to energy and water conservation, and to pollution prevention. The recycle and recovery of all pulping and bleaching process wastewaters is termed "closed cycle." The pulp and paper industry is rapidly developing closed-cycle technologies.

#### *Closed-Cycle Installation Cuts Costs*

In 2000, L-P's kraft pulp mill in Samoa, California, produced TCF bleached pulp using features of a closed-cycle process. This success builds on L-P's earlier effort to eliminate chlorine bleaching and harmful dioxin effluents, making it the first plant in North America to produce TCF pulp.

L-P implemented the CC-TCF process to establish industry leadership for environmental stewardship and to improve plant performance, enabling them to produce a competitively priced TCF product. The upgrade included many steps, the most significant being:

1. Installing an "X-Filter" for advanced green liquor filtration

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\* air-dried tonnes (metric)



2. Modifying the filtrate recycle configuration
3. Extending the digester cooking process

With this \$7.2 million project, the Samoa plant became the first site in the world to produce pulp using a CC-TCF process. This upgrade cut operating costs by about \$700,000/year as shown in Figure 1.

Figure 1: Savings from CC-TCF Improvements

Plant Area	Savings	Value	Source
Bleach plant steam	43%	\$500,000	Heat recovery and water recycling
Lime-kiln gas	5%	\$200,000	Improved production capacity

## Process Changes Cut Pollution and Water Use Cost Effectively

The key to L-P's success has been the company's ability to identify water reuse and treatment opportunities *within* the plant processes, rather than just treating "end-of-the-pipe" waste streams. Such an approach has proven not only technically superior, but also very cost effective.

One piece of equipment—the Ahlstrom X-Filter™—required 92% of the total CC-TCF project cost. This critical, unique unit allows the plant to recycle wastewater that would otherwise be discharged to the ocean. Project personnel implemented all other improvements at a cost of only \$600,000.

## Pending Enhancements Will Nearly Eliminate Bleach Plant Effluent

L-P's CC-TCF demonstration confirmed that the process delivers high-quality pulp. However, the process also reduced production capacity. Therefore, L-P's planned \$6 million upgrade is designed to recoup that lost capacity and make the process cost-competitive with standard bleaching techniques by further "closing" plant process flows, thereby reducing fresh water use and outgoing effluent flow. Closing plant flows also reduces operating costs by cutting chemical and steam usage. The upgrade will include four steps:

1. Retrofitting the oxygen delignification unit to have two stages
2. Installing new pulp washers
3. Installing a pressurized peroxide bleaching system
4. Replacing the bleached pulp cleaner

The enhanced CC-TCF process will deliver the performance improvements noted in Figure 1, as compared to the current CC-TCF baseline established in 2000. In particular, bleach plant effluent will be nearly eliminated.

Figure 2. Estimated Performance Improvements from CC-TCF Upgrade

Improvement	Change	New Level
Production capacity	up 17%	636 ADt/day*
Bleach plant effluent	cut 96%	0.7 m <sup>3</sup> /ADt
Mill water use	cut 48%	22 m <sup>3</sup> /ADt
Mill effluent	cut 29%	71 m <sup>3</sup> /ADt

\*Expected CC-TCF capacity is within 1% of the pre-TCF capacity.

